C1550-2 A

SIX DOLLARS

A CAHNERS PUBLICATION

Electronic Business.

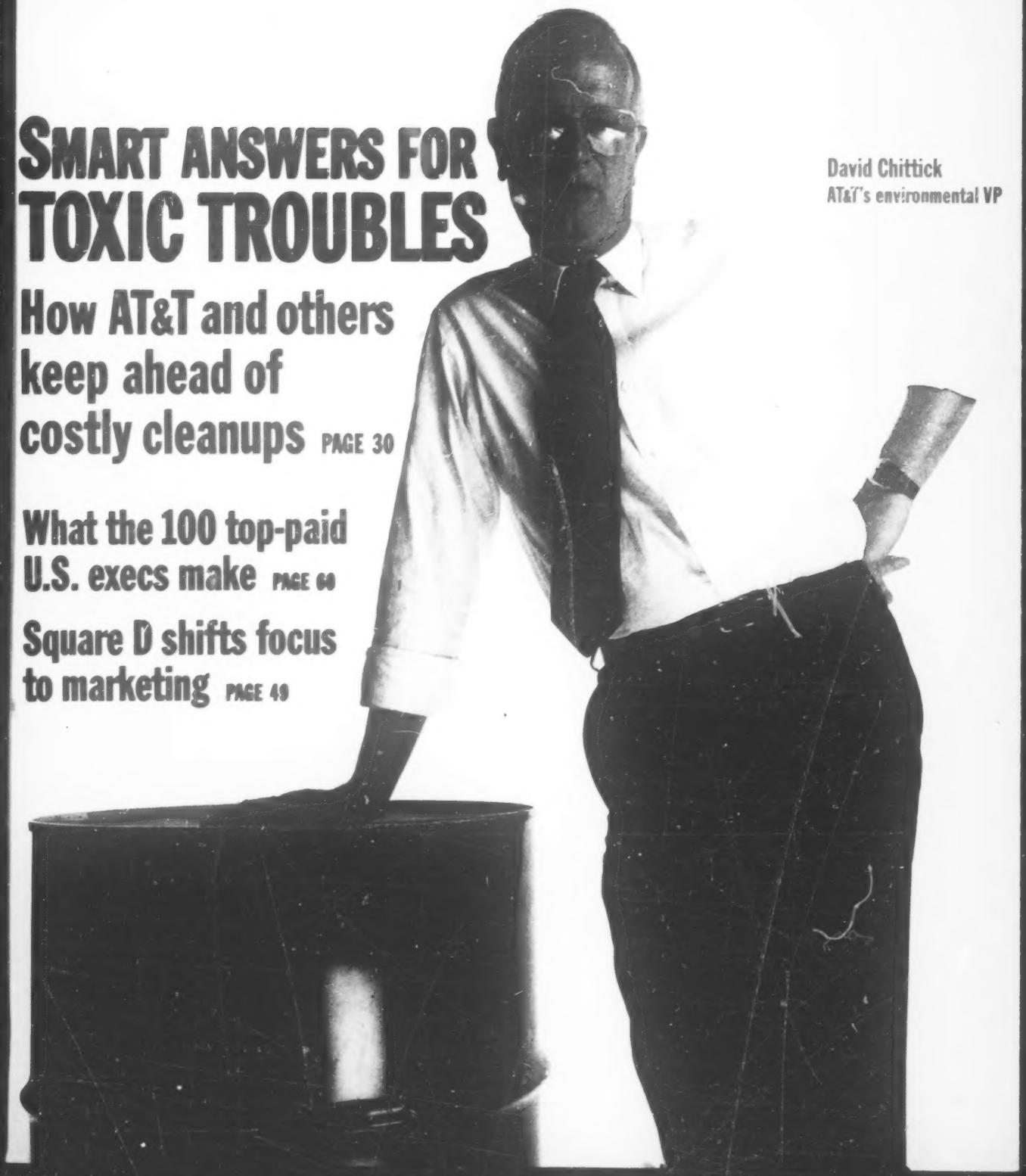
FOR MANAGEMENT IN ELECTRONICS, COMPUTER & SYSTEMS COMPANIES — WORLDWIDE SEPTEMBER 18, 1989

SMART ANSWERS FOR TOXIC TROUBLES

How AT&T and others keep ahead of costly cleanups PAGE 30

What the 100 top-paid U.S. execs make PAGE 60

Square D shifts focus to marketing PAGE 49



David Chittick
AT&T's environmental VP

Electronic Business

FOR MANAGEMENT IN ELECTRONICS, COMPUTER AND SYSTEMS COMPANIES — WORLDWIDE

VOL. 15, NO. 19 SEPTEMBER 18, 1989

PAGE 32 AT&T's environmental vice president David Chittick: "Don't take things for granted. Even the smallest detail can't be overlooked"

COVER STORY/STRATEGIES

30 Smart answers for toxic troubles

It is rapidly becoming clear that environmental issues are being forced far higher on the agenda of electronics management. As the industry loses its pristine image and as vigorous new legislation comes on strong, electronics executives now must make environmental affairs a part of their strategic thinking. Some companies, such as AT&T and Tektronix, are ready. For those that aren't, ELECTRONIC BUSINESS, in this special report, offers a blueprint for action.

BUSINESS TRENDS

17 The amazing, shrinking, flexible fab of the future

The demand for custom chips and the need to cut clean-room costs are challenging the need for megafabs.

22 Rad-hard chips gain in military tactical market

Manufacturers of radiation-hardened semiconductors are looking at the tactical weapons systems market for big opportunities.

ENVIRONMENT

30 Smart answers for toxic troubles

Minding the environment is simply good business. Electronics companies ought to be aware. Driving environmental topics up the agenda are four key factors: thorny new legislation that has the blessing of the Bush administration; public pressure boosted by the Exxon Valdez spill; an international mandate to eliminate by the year 2000 the use of chlorofluorocarbons, and recent court decisions that hold companies responsible for toxics cleanup.

32 AT&T's big push to stay ahead of environmental woes

AT&T has publicly proclaimed it will eliminate all CFC emissions from its manufacturing processes by 1994. But the complete eradication of CFCs certainly will be difficult and may well be an unattainable goal. Clearly, AT&T is putting its reputation on the line before the public, environmentalists and lawmakers.

40 Tektronix on toxics: Looking good by using less

Putting nature first is second nature at Tektronix. The Beaverton, Ore., test and measurement company's reactions to environmental issues are pure reflex, where protecting Mother Earth with techniques that minimize toxics makes good business sense as well.

42 Sound environmental practices add to bottom line

From board makers to defense contractors, large and small, the solutions offered for cleaning up are innovative and dramatic. ELECTRONIC BUSINESS culls the most compelling examples of environmental management in action.

STRATEGIES

49 New culture at Square D puts the focus on marketing

With energetic captain Jerre L. Stead at the helm, the once-staid electrical equipment maker is undergoing a "huge culture change" — moving aggressively to expand sales vertically and overseas. Stead's aim is to grab market share away from competitors in the industrial sector in programmable logic controllers and a host of automation, power and distribution equipment as well.

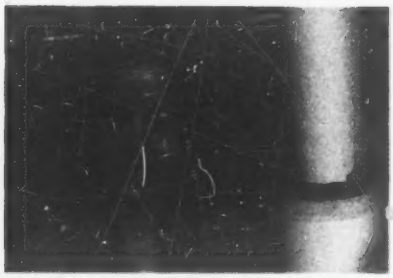
MANAGING RESOURCES

60 Top bosses' pay slows in sluggish electronics sector

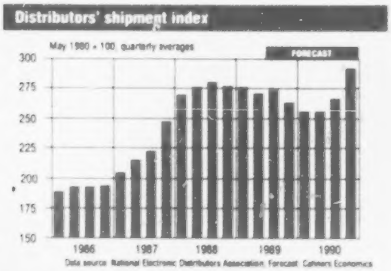
The superstars of the executive suite barely kept pace with inflation in 1988, while the rank and file of electronics executives managed to keep moving ahead. Apple's John Sculley again tops the ELECTRONIC BUSINESS list of the 100 highest-paid U.S. executives. Sculley made nearly $2.5 million in salary and bonuses last year.

PAGE 49 Square D chairman Jerre L. Stead: "For the first time, we'll be focused on a market and not a product orientation, or on technology"

PAGE 79 The expanding neural marketplace challenges Japanese engineers



PAGE 40 Tektronix's Theresa Parrone: Cut emissions by using fewer toxics



PAGE 113 Business Barometer: Rumblings of the slowdown

PAGE 85 Hadco's Jon Kropper: Pushing PCB equipment makers to enhance capabilities

PAGE 17 Lasarray's Tim Fitzgibbons: The shrinking, flexible fab of the future

EUROPE BUSINESS

73 European auto market beckons chip producers

The global auto market has become increasingly important to semiconductor producers. But if chip makers have been depressed by a U.S. car market that is stuck in neutral, they should look eastward to Europe, where sales are zooming along in overdrive. Add increasing sales to new emissions rules for European Community nations and there's a bonanza to be had.

ASIA/PACIFIC BUSINESS

79 Expanding neural marketplace challenges Japanese engineers

In engineering labs across Japan, scientists are turning increasingly to chemistry and biology to create new designs for neural network computer systems. Customers of at least one Japanese company — NEC — are using neural network systems in personal computers. These are used primarily in research and development environments to further work in pattern recognition, expert systems, movement control and signal processing.

MARKET PERSPECTIVES

85 Users push board makers to enhance equipment capabilities

While the business of fabricating printed circuit boards is forecast to rise a mere 1% to 2% this year after a banner year in 1988, companies that fabricate and stuff boards are spending heavily on new capital equipment to stay competitive in a demanding marketplace. Vendors that come up with new concepts to meet the challenges are finding eager buyers, both in the United States and overseas.

CONTRACT MANUFACTURING

91 Contract service outfits' revenue keeps booming

There just seems to be no stopping the growth of companies that find their niche in helping design, manufacture and test the electronics of others. Despite doldrums in some parts of the electronics industry, these concerns just keep on keeping on. The 114 firms responding to the ELECTRONIC BUSINESS survey for the 1989 Contract Manufacturing Directory say they are on track for significant revenue growth this year compared with 1988.

BUSINESS BAROMETER

113 **Distribution**

For distributors, the rumblings of slowdown have suddenly blasted loud and clear through the bullhorn called bookings.

114 **Components**

Like other electronic markets, components manufacturers have also succumbed to an economic slowdown.

DEPARTMENTS

5 **Inside Business**

9 **Letters**

11 **Upstarts**

Dynabook Technologies, Tera Computer and XRL

105 **My View**

Smart marketing. And the dumb car

106 **Advertiser index**

116 **Viewpoint**

Say goodbye to the "mom and pop" chip fabs?

COMPANIES IN THIS ISSUE

100 **An index of the companies covered in this issue.**

EDITORIAL STAFF

Publisher: Frank J. Burge

Editor: Jeffrey Bairstow

Editor-at-large: John Kerr

Managing Editors: Jim Asker, Roger C. Plant

Senior Editors: Linda Stallmann (Financial), Bruce C. P. Rayner, Valerie Rice

Associate Editors: Barbara N. Berkman, Anthony E. Greene, Michael R. Leibowitz, Rick Whiting

Assistant Editors: John McCreadie, Xiong Xiaoge

Section Editor: Marvin V. Greene

Copy Editor: Barbara Jorgensen

Research Editor: Michelle D. Doses

Contributing Editors: Elizabeth Baatz (Cahners Economics), Euan Barty (Hong Kong), Dwight Davis (Boston), Madeline Franchi (Cahners Economics), Sarah Glazer (Boston), Shohei Kurita (Tokyo)

Consulting Editors: Alberto Socolovsky, Allen Furst (China)

Production Editor: Karen J. Covey

Editorial Assistant: Jean O'Brien

ART STAFF

Art Director: Bill Cooke

Associate Art Director: Carla Aguilar Leeder

EDITORIAL OFFICES

Boston: Cahners Building
275 Washington Street, Newton, Mass. 02158
(617) 964-3030 Telex 94 0573 CPC BSN
Fax (617) 558-4327 MCI EBBOS

Washington, D.C.: Anthony E. Greene
1333 F Street, N.W., Suite 720
Washington, D.C. 20004 (202) 628-2773

San Jose, Calif.: Valerie Rice (Bureau Manager), John McCreadie
Sherman Building, 3031 Tisch Way, Suite 100
San Jose, Calif. 95128 (408) 296-0868

Irvine, Calif.: Bruce C. P. Rayner
18818 Teller Avenue, Suite 170
Irvine, Calif. 92715 (714) 851-9422

Northwest: Paula Doe
5011 133rd Place SE
Bellevue, Wash. 98006 (206) 641-0903

PRODUCTION

VP Production: Wayne Hulitzky

Director of Production/Manufacturing: John R. Sanders

Production Supervisor: Andrew A. Jantz

Production Manager: Betsy Harkins; (617) 964-3030

CIRCULATION

Group Circulation Manager: Ann Ward
44 Cook Street, Denver, Colo. 80206
(303) 388-4511

Total Circulation: 77,804

REPRINTS

ELECTRONIC BUSINESS articles are available on a custom printing basis at reasonable prices. Contact Joanne Westphal, Cahners Reprint Service, Cahners Plaza, 1350 E. Touhy Ave., P.O. Box 5080, Des Plaines, Ill. 60018 (312) 635-8800
Electronic Business can be purchased on 35mm microfilm through University Microfilm Int. Periodical Entry Dept., 300 Zeeb Road, Ann Arbor, Mich. 48106

Welcome to the team

A few issues ago, we announced on this page Jeff Bairstow's appointment as editor. During the intervening months, we at ELECTRONIC BUSINESS have taken some very definite steps aimed at continuing our magazine's tradition of quality. One of those is the selection of Jim Asker as managing editor/editorial.

We are lucky to get Jim. He brings in more than 15 years as a reporter, writer and editor. Most recently, Jim was a Boston-based free-lancer, writing about science and technology.

Most of Jim's career has been spent in Texas. He joined *The Houston Post* after graduating from Rice University, where he studied economics, applied math and history. He made his mark at *The Post* covering the space program, breaking some big stories following the Challenger disaster. Jim's work landed him a finalist spot in the Journalist in Space program. He was one of 40 Americans selected from 1,700 journalists who applied to be the first to fly aboard the shuttle. Jim came to Boston as a Knight Science Journalism Fellow at the Massachusetts Institute of Technology — studying for a year at MIT and Harvard.

Jim's background will be a boon to us. Surely, he has the technical credentials that gives him insight into electronics. But since we're also in the journalism business, a newspaperman's mentality won't hurt either. Jim's primary responsibility will be to oversee the reporting and writing of our talented and far-flung editorial staff. Welcome to the team.

Jim Asker, managing editor

Quality issue; automation award

• When the mail arrives Oct. 2, your issue of ELECTRONIC BUSINESS won't be in the stack. That's because we've decided to marshal our editorial energies toward producing a blockbuster Oct. 16 issue that will focus entirely on the issue of quality in the electronics industry. Our special issue is a prelude to the announcement of winners of the second annual Malcolm Baldrige National Quality Award. We'll offer a fresh and detailed examination of quality and American competitiveness.

• In our March 6 issue this year, Texas Instruments Inc. was announced as the recipient of our annual "Electronics Factory Automation Award," recognizing its circuit-board facility in Johnson City, Tenn., as the outstanding example of automation in action. We'll make another award in early 1990 and are seeking entries. The entry deadline: Nov. 3. For entry information, call Susan Parziale of our staff at 617-558-4621.

MARVIN GREENE, section editor

ELECTRONIC BUSINESS® (ISSN 0163-6197) is published bi-weekly, except monthly in December, by The Cahners Publishing Company, A Division of Reed Publishing USA, 275 Washington Street, Newton, MA 02158-1630. Terrence M. McDermott, President. Frank Sibley, Senior Vice President/General Manager, Boston Division. Jerry D. Neth, Senior Vice President/Publishing Operations. J.J. Walsh, Senior Vice President/Finance. Thomas J. Dellamaria, Senior Vice President/Production and Manufacturing. Ralph Knupp, Vice President/Human Resources. Circulation records are maintained at Cahners Publishing Company, 44 Cook Street, Denver, CO 80206-5800. Telephone: (303)388-4511. Second-class postage paid at Denver, CO 80206-5800 and additional mailing offices. POSTMASTER: Send address corrections to ELECTRONIC BUSINESS® at the Denver address. ELECTRONIC BUSINESS® copyright 1989 by Reed Publishing USA. Ronald G. Segel, Chairman and Chief Executive Officer; Robert L. Krakoff, President and Chief Operating Officer; William M. Platt, Senior Vice President. Annual subscription rates for non-qualified people: USA/Canada/Mexico: $69.95 per year; other countries, $110 per year (including air freight). $210 per year for air mail. Except for special issues where price changes are indicated, single copies of regular issues are available for $10.00 (USA, Canada/Mexico and foreign). Please address all subscription mail to Eric Schmierer, 44 Cook Street, Denver, CO 80206-5800. Cahners Publishing Company, A Division of Reed Publishing USA • Specialized Business Magazines for Building & Construction • Manufacturing • Foodservice & Lodging • Electronics & Computers • Interior Design • Printing • Publishing • Industrial Research & Technology • Health Care • Entertainment. Specialized Consumer Magazines: American Baby • Modern Bride.

BPA ABP

Rad-hard chips gain in military tactical market

As space and strategic systems fly high with radiation-hardened chips, the tactical market is poised to take off

When the U.S. Department of Defense shifted its nuclear policy in the early part of the decade from a strategy of mutually assured destruction to one of survival through use of tactical systems, electronics-equipment manufacturers lacked the technology to meet its standards.

Now, electronics is catching up. Until 1983, lead shielding was almost the only protection for sophisticated electronics. Today, advances in semiconductor-process technology have resulted in chips that can withstand ever higher levels of radiation, and this means big opportunities for military chip makers. As a result, the DOD is requiring that battlefield equipment function during and after a nuclear exchange.

Right now, the dollar volume for the tactical rad-hard semiconductor market is still negligible. But this market segment is about to take off. Most of the low-cost chips are either in the process of DOD qualification or the manufacturer is still bringing product to market.

Staggering military market

Why the sudden interest in tactical applications? The potential is staggering. The total worldwide military demand for semiconductors is estimated at about $2 billion — $400 million for space and strategic systems and $1.6 billion for tactical systems. Dataquest Inc., a San Jose market-research firm, estimated the total North American rad-hard market at about $330 million in 1988, with a growth rate of 24% each year over the next three years.

That $330 million was spent almost exclusively on satellites, strategic-weapons systems and the Strategic Defense Initiative program, where expensive and exotic technologies — gallium arsenide, silicon on sapphire, and silicon on insulator — are standard fare.

What is more exciting to companies is the $1.6 billion tactical market. While the total tactical-semiconductor market is estimated to be growing only about 5% a year, market observers have the radiation-hardened and radiation-tolerant portion posting anywhere from 7% to 20% annual growth.

"There appears to be a void as far as serving the tactical market," says Dick McCoy, product-line manager for semiconductor products at United Technologies Microelectronics Center (UTMC) in Colorado Springs, a manufacturer of semicustom and military-standard very large-scale integration chips. Defense contractors typically either buy exotic technologies, or they pick up non-rad-hard parts and then try to qualify those themselves.

Aggressive marketing

UTMC is aggressively trying to capture a chunk of the rad-hard market with its new line of application-specific integrated circuits. It is taking its high-end rad-hard chips that go into space and strategic systems and selling them at a lower price into the tactical market.

North American rad-hard semiconductor production

($ millions)

	1987	1992
ICs		
Standard logic/PLD	$37.1	$66.7
ASICs	46.7	156.1
Microcomponents	31.8	111.3
Memory	47.6	121.6
Linear	63.9	143.0
Total ICs	**$227.1**	**$598.8**
Discretes	$34.7	$70.0
Optoelectronics	$8.9	$18.8
Total rad-hard semiconductors	$270.7	$687.5

Source: Dataquest Inc

Even with expected budget trimming, military retrofits, upgrades and designed-in applications all hold promise for rad-hard chip makers

"We can do so because the amount of testing and the level of assurance is lower in the tactical marketplace," says Jim Adams, UTMC's director of strategic planning. The cost of testing in the strategic marketplace is astounding. According to one independent source, testing for space qualification can run from $10,000 to $100,000 per device type.

UTMC is not alone in its bid for tactical business. Harris Semiconductor, a sector of Harris Corp. in Melbourne, Fla., is in the process of introducing a whole new line of rad-hard chips aimed at the tactical market. Called the Radiation-Hardened Assurance Program (RHAP), Harris expects to blitz the market with more than 300 types of rad-hard or rad-tolerant chips before year end, ranging from metal-oxide semiconductor field transmitters (MOSFETs) to microprocessors to complementary metal-oxide semiconductor logic chips.

"We have taken what we learned in space and applied it to the general-purpose JAN B products," a joint Army-Navy specification system, says Bob G. Quinn, vice president for strategic marketing for Harris Semiconductor's military and aerospace division.

Harris is the one to watch when it comes to military semiconductors. It is by far the largest supplier, accounting for 10% to 15% of the total U.S. military market. With its acquisition of General Electric Solid State in Somerville, N.J., last December and with other acquisitions reportedly in the making, that position is strengthening.

Other companies are eyeing the market, too, including Texas Instruments Inc. in Dallas, National Semiconductor Corp. in Santa Clara, Calif., and LSI Logic Corp. in Milpitas, Calif. All are keeping tabs on the tactical arena while continuing to focus on the space and strategic business. "We are seeing radiation-tolerant requirements being placed on tactical weapons," says Thomas Smith, TI's business development manager for military products.

National's Steve Kelley, marketing manager for military CMOS logic, confirms this. Battlefield equipment used in the European theater is particularly vulnerable due to the high number of tactical nuclear weapons, he says. National's Fairchild advanced-

CMOS technology (FACT) family of logic chips has one of the higher radiation-tolerance levels on the market. Currently, most applications are in the space and strategic market, but National is also incorporating the FACT devices into the head-up display for the Air Force's advanced tactical fighter (ATF), Kelley says.

An added boon to the rad-hard market came in April. The DOD eased its chip export regulations in an effort to help U.S. chip makers recover lost market share and improve their global competitiveness.

Part of the reason the tactical market is enjoying increased appeal is that SDI and other strategic programs could face serious budget cuts as the defense budget is trimmed to meet the Gramm-Rudman budget-reduction law. Many tactical-weapons systems and the chip makers that supply them will benefit from the budget cut, because retrofits and upgrades will become more common.

For instance, the F-16, the multirole fighter made by General Dynamics Corp. in St. Louis, is said to be scheduled for radiation hardening around 1991. The same goes for the Navy's F-14Ds and the Army's M-1 tank. In fact, a number of leading chip makers foresee the retrofit market as providing the biggest part of the tactical rad-hard business. "We are pretty bullish because of retrofits," says Marybeth Rotermund, director of military-aerospace marketing at LSI Logic. She expects 10% to 15% growth in the tactical rad-hard market for ASICs.

Still, new defense programs with designed-in rad-hard chips also hold promise. About 40% of new programs are incorporating some degree of radiation hardening, TI's Smith says. These reportedly include such major buys as the ATF; the Navy's advanced tactical aircraft (ATA); the advanced medium-range air-to-air missile (AMRAAM); the army's fiber-optic guided missile (FOG-M); the single-channel ground and airborne radio system (SINCGARS); the advanced anti-armor weapon system — medium (AAWS-M); and the search-and-destroy armor (SADARM) missile.

BRUCE C.P. RAYSER

What's a radiation-hardened semiconductor?

There is some confusion as to the definition of a radiation-hardened semiconductor. Some firms spend millions to develop exotic materials and technologies specifically to withstand high levels of radiation. Then, others claim they make rad-hard chips for military use, but in reality there is nothing fundamentally different between their commercial and military products. Can both claim rad hardness?

Simply put, no. Rad hard refers to a designed-in requirement by the customer — usually the military — and it means a fairly high level of radiation protection. The term radiation tolerant, on the other hand, is commonly applied to chips that have some intrinsic hardness, but have not been developed specifically with rad hardness in mind. Both have a place in the military's demand for semiconductors.

In 1983, the DOD issued a directive calling on the armed services to specify radiation-hardened or tolerant semiconductors in their designs of tactical-weapons systems. In July 1988, an update was issued, additionally requiring that certain existing systems be retrofitted with rad-hardened chips.

Generally, electronics must be protected against four types of radiation: total dose, single-event upset (SEU), neutron effect and dose rate. Spacecraft, satellites and strategic systems must be shielded from all four types of radiation. Satellite systems, for example, have to be protected against long-term radiation (total dose and SEU) from the Van Allen belts and the sun. Tactical-weapons systems, such as fighter planes, ships, submarines, ground-based computers, communications equipment and other command and control equipment, need only be guarded against fallout from nuclear explosion (neutron effect and dose rate).

Rad hard refers to a designed-in requirement by the customer — usually the military

Space and strategic applications are by far the more demanding when it comes to radiation hardening, requiring protection on the order of 100 kilorads. (A rad is the basic unit of measure for the absorption of ionized radiation.) This is the realm of gallium arsenide, silicon on sapphire, and silicon on insulator. Tactical weapons, on the other hand, require between 10 to 20 kilorads of protection. Yet they tend to be much more cost sensitive because of the high volumes of chips involved.

Chips used in space and strategic applications have to satisfy strict testing and assurance requirements, known as JAN S for joint Army-Navy, level S. Tactical chips have to comply with JAN B, which is less stringent. Neither fully qualified JAN B nor JAN S products are allowed to be made offshore. Much of the cost difference between JAN S and JAN B is in the testing.

In some weapons systems, the line between strategic and tactical is starting to blur, since the long-term effect from exposure to radiation is important for tactical systems as well. The DOD wants equipment that will be reusable after a nuclear exchange. It also wants weapons systems, such as the cruise missile, that can withstand long exposure and still function.

The DOD has set stringent requirements for assurance and testing for both space and tactical electronics. It has also designated four levels of radiation hardness called the Radiation Hardness Assurance (RHA) categories that defines the integrity of the part the semiconductor maker must guarantee for any particular rating. However, specific weapon systems set their own rad-hardness based on the perceived threat and function of the system. Most of these specifications are classified. □

New culture at Square D puts the focus on marketing

With an energetic captain at the helm, the once-staid electrical equipment maker is moving aggressively to expand sales vertically and overseas

BY BARBARA N. BERKMAN

Flush with energy — his daily 6-mile run starts at 5:30 in the morning — Jerre L. Stead is on the road again. During the two years since he assumed leadership of Square D Co., Stead estimates he has spent 40% of his time delivering a single message to customers, distributors and Wall Street: Square D has been reborn.

For years, Square D has profitably turned out switches, relays, control products, and power and distribution equipment, largely for the residential and construction markets. But in the 1980s, earnings growth slowed. A Swiss army knife of electrical suppliers, selling everything from copper foil to home automation systems, Square D burdened itself by marketing 18,000 items to several diverse markets. The $1.7 billion company left itself open to cyclical swings by becoming dependent on the construction industry for 53% of worldwide sales.

Now, aided by what Stead calls "a huge culture change," Square D is moving aggressively toward increasing sales to industry and overseas. Chairman Stead's strategy: downsize, and restructure Square D's organization and sales network along vertical markets and increase selling and administrative expenses to 22% of sales. His aim is to take market share away from competitors in the industrial sector in programmable logic controllers (PLCs) and a host of automation, power and distribution equipment as well.

The cornerstone of Square D's cultural awakening is marketing. The Palatine, Ill., company never has made an effort to sell the industrial original equipment manufacturers its total product line. But in June, Stead restructured Square D along three vertical markets: industrial, construction and international. "For the first time, we'll be focused on a market and not a product orientation, or on technology. It will allow us to be much more focused," says the former Honeywell Inc. vice president. "We've never gone in and sold that total package of capability [across product lines] to the customer."

Stead is executing a strategy he inherited from Dalton Knauss, Square D's recently retired chairman who became the company's president in 1984 and hand-picked Stead to be his successor. The 46-year-old Stead took over as president in 1987 and as chief executive and chairman earlier this year.

New operating, financial goals

Since then, Stead has introduced a new set of operating and financial objectives. To meet those goals, he also incited cultural change. A believer in teamwork and "self-directed work forces," his management style is "driving decision making and authority far down into the organization."

Says Stead, "I don't believe in policy and bureaucracy, because people hide behind them."

The new discipline is already show-

Square D chairman Jerre L. Stead: "For the first time, we'll be focused on a market and not a product orientation, or on technology"

ing up in improved earnings. Sales in the first half of this year increased 10.9% to $885.7 million from $798.9 million during the same period a year earlier. Still, net earnings rose only 2.2% to $59.8 million, in part because of a stock buy-back program.

That's a big jump over 1987, when Square D's electronic products group had an operating loss of $6.6 million after a restructuring charge. The company is moving away from electronic products, whose earnings have lagged behind those from Square D's core electrical business.

Revenue from electronic products, including PLCs, copper foil, semiconductors, power conditioning equipment, welder controllers and uninterruptible power systems, contributed 17% of the company's 1988 sales. Two electronic product units — copper foil maker Yates Industries and power equipment maker General Semiconductor Industries are being sold. To strengthen its position in PLCs, Square D bought Crisp Automation Inc., a process control maker, in mid-July.

Ever the marketer, Stead is making sure Wall Street takes notice. "He is getting the word out about how much the company has changed, judging by the stock price," says Robert Cornell, an analyst with Shearson Lehman Hutton Inc.

On Wall Street and within Square D, Stead is a natural communicator. His answers often are prefaced by the phrase, "That's a good question" —a speaking mannerism that encourages inquisitiveness, particularly from Square D employees. "I am a great believer in role models for making change happen, so I like to spend time with people," he says.

Vision College

To further communicate his goals to his work force, Stead is providing the opportunity for all employees to attend Vision College, a two-day session that drums in Square D's 24 "vision" principles. Stead claims to have

Ever the marketer, Stead is making sure Wall Street takes notice

answered personally more than 3,500 letters to Ask the President, an internal-communication program linking him to the trenches. Other forums: quarterly communication videos to all operations; routine informal lunches with no more than 10 employees whose birthdays fall during that month; "fireside" chats with a handful of managers; and spending 60% of his time visiting operations, delivering a 20-minute speech, then fielding employees' questions.

This type of corporate chitchat is new to Square D, says Stead. "We were a company where you weren't allowed to ask anyone about anything."

The openness has produced a wealth of exchanged ideas, according to sales staff. "The cultural change is working with the majority of people," says one field sales representative. Yet, he mentions, some of the old-timer marketing and sales staff find the transition difficult. "This new enlightenment about how to do business — it's almost insulting to be told this is miracle stuff."

One major change is that Stead has overhauled the sales incentive system to eliminate the unprofitable sale driven by volume. "People were paid on volume sales," says another sales rep. "When they couldn't afford the time, they could always go to the commercial sale for volume." Says corporate account manager Bill Matthaei, "The focus is on the customer instead of getting the order. I don't feel the pressure to get high volume."

There's still some grumbling about accepting new sales practices, particularly Square D's push to keep prices stable. One account manager claims Square D balks at shaving 2% or 3% off the price of power equipment. Not true, says Stead. "We shave up to 15% off prices every day of the week," he claims, adding that the company has "worked hard to bring prices in power equipment up."

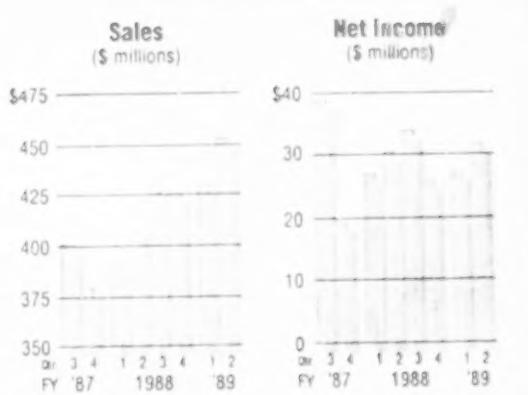
Another sour point is that Square D has been slow to apply resources

Square D at a glance

	1988	1987	Change
Sales ($ millions)	$1,657	$1,484	+11.6%
Net income ($ millions)	$119	$110	+8.1%
Net income/ sales	7.2%	7.4%	—
Cost of sales/sales	66.8%	64.8%	—
R&D/sales	3.0%	3.0%	—
Marketing, G&A/sales	21.6%	20.8%	—
Number of employees	20,700	19,800	+4.5%
Sales per employee	$80,037	$74,961	+6.8%
Net income per employee	$5,746	$5,556	+3.4%
Capital expenditures/sale	5.1%	2.9%	—
Current ratio	1.57	1.71	—
Debt/equity ratio	0.44	0.36	—
Foreign sales/sales	19.8%	19.0%	—

All figures for fiscal year ending December 31

Quarterly results



Source: Company reports

to form partnerships with other companies. "Our most significant challenge is to develop partnering methods to allow us to increase our visibility in front of the customer," says a Square D account manager. Stead responds that Square D formed 21 partnerships over a recent 16-month period.

Internal changes

Though not altogether visible to customers, the new era has had profound internal effects on Square D.

First is the effect of change itself. More than half of the company's 50 senior managers are outsiders, as are half of the sales managers in the Automation Products group. Accompanying the influx of outsiders, including Stead, has been a score of internal reorganizations. "I would just like a little stability to our own structure," complains one sales rep. "We're sitting here with our hands on our hips, saying, 'What are we trying to do?' You can only do that so long. When you make these changes, the competition grabs at it."

The changes in marketing and sales are sweeping, as Stead chases what he estimates to be a $2 billion global market for PLCs, welding controls and press control applications. He dismantled three organizational levels, as of July leaving three layers between himself and field sales: a sales vice president, 10 regional vice presidents and 91 district managers.

Management fired or retired 100 salespeople from a worldwide force of 1,600 and added 300 newcomers. Companywide, Square D has pared away 10% of its work force and sold off 12 plants since 1986. Square D is allocating 2% of payroll to training, adding role playing for field sales staff, who previously went through a 14-week course on products, pricing, entering orders and "three minutes on how to sell," says Stead.

The advertising and promotion budget leaped to $24.5 million in 1989, up from $16.5 million in 1987. A major expenditure has been revamping Square D's relationships with distributors.

"We had a lot of people who really believed our distributors were our customers. They're not. They're our partners." Asked by distributors for his definition of partner, Stead replied, "We'll share the risks together, and we'll share the rewards together." In May 1988, Square D offered a 1.5% above-margin promotion incentive to distributors who committed to a single line. Stead expected about 400 of the company's 1,200 distributors to join the costly program. A year later, 820 distributors have signed up.

Vertical marketing

Perhaps the major change is the emphasis on vertical marketing. Last year, Stead created Corporate Market Development (CMD), a 40-salesperson section targeting four vertical markets with high capital expenditures: food and beverage, transportation, paper and chemical, and the federal government. By 1993, Stead expects to see $400 million to $500 million of additional business from CMD.

Square D has begun targeting vertical markets with high capital expenditures: food and beverage, transportation, paper and chemical, and government

To reach the automotive automation market, Square D also added 36 salespeople over the past two years, intending to push its domestic market share over its current 5% to 8%. The company is the industry leader in electronic welder controls, a niche in which Allen-Bradley Co., the company's archrival in automation products, doesn't participate.

The revamped selling program is expensive. Selling, general and administrative expenses edged up 3% since 1985, to 22%. "The 'S' is up more," says Stead. "The 'G&A' is down because we knock down bureaucracy wherever we can."

Square D still faces a future of marketing obstacles. The company is determined to nurture vertical industrial markets, at the same time boosting international sales from 20% of consolidated sales in 1988 to 40% by 1995. All the while, Square D must continue to support its traditional base in construction. Allen-Bradley, in contrast, can concentrate its marketing resources on a relatively limited product line, largely for a single market.

"We are not 100% tied to the industrial market, but almost. Our ability to get to that market is very focused," says J. Tracy O'Rourke, president of Allen-Bradley, the Milwaukee-based industry leader in a global PLC market dominated by Asea Brown Boveri AB, Siemens AG, Lucky Goldstar Group, Westinghouse Electric Corp., AEG AG, Square D and Texas Instruments Inc. Allen-Bradley and Siemens both hold a 24% market share. After Allen-Bradley and Siemens, no player has more than a 12% market share. Square D has an estimated 10% share.

Competitive advantage

But market share isn't Allen-Bradley's only competitive advantage. "In general, we have several times more bodies who can go after the industrial market on any day than Square D does," says O'Rourke.

For example, Allen-Bradley has three people selling PLCs in Houston; Square D has one. The company is outmanned in other vertical markets as well, such as pulp and paper. There, the major challenge is credibility, says corporate account manager Bud Palmer. "They doubt we have a serious commitment," he says. "We had five people at an industry gathering in Atlanta in late June. Allen-Bradley had 20 to 30."

Square D had never been a talented marketer before. Its new emphasis on customer service is an even a stronger departure from the past. "Square D has quality products, but it had not been calling on enough people," says analyst Robert Hedrick of Eppler Guerin & Turner Inc. "New management will go in that direction, and it's getting much better."

Take, for example, John Newton, who for years bought Square D's power distribution equipment, but shunned its PLCs in favor of those from Allen-Bradley and TI. "In

switch gear and power distribution. Square D's reputation is good," explains Newton, manager of advanced control systems for the Campbell Soup Co. in Camden, N.J. "But on the PLC side, it is not recognized as an industrial leader."

Despite that conviction and his memory of some quality and service problems with Square D switches, Newton is listening to the company's newly aggressive sales pitch. Campbell is one of 21 food and beverage industry companies Square D's CMD salespeople are wooing as a national account, and "they realize we are an unsatisfied customer," says Newton. "For the first time, they've promised us better service."

Critical test

Square D's new pitch has yet to pass a critical test: luring industrial automation customers away from Allen-Bradley. Square D has a strong market for products such as panel boards and circuit breakers, items Allen-Bradley doesn't offer. But in every vertical market targeted by Square D, it encounters an Allen-Bradley that has been entrenched firmly for years. "Historically, Square D didn't make as good a move into electronics as it should have. It was a laggard in the PLC market," says Shearson analyst Cornell.

But prying away traditional Allen-Bradley PLC customers will be a tough sell, and Square D probably will be successful only with renovated or new plants. Laments one Square D sales rep, "If anyone looked at our capability and support and product in general, we'd have them beat with product. But a lot of plants are so familiar with Allen-Bradley that even if they wanted to, it's difficult to change."

Take General Foods Corp., in transition since its acquisition by Kraft Inc. and therefore an important target for automation products. "We're not sure where the corporation will stand regarding Square D vs. Allen-Bradley," according to Michael McDonald, a project engineer with General Foods in Fulton, N.Y. "The Square D national account manager has said the local reps would follow up on service and quality, and they've done well. They did see this as an opportunity to break the Allen-Bradley tradition."

General Motors Corp. is another targeted national account — one that has been hard to crack. Square D lost out on automating the celebrated Saturn plant, only picking up about $1 million in business for Saturn's electronic welder controls.

"Our people are familiar with the equipment and how it operates," says Thomas Pauli, electrical facilities engineer for GM's Hydro-Matic division, which uses PLCs from Allen-Bradley and Modicon Inc., an AEG subsidiary. "In order for us to change to a new manufacturer, it would require some significant benefits. Square D was just a little late in coming on-line, and it's an uphill battle from now on."

One niche is with customers who use Allen-Bradley's family 2 PLCs, but are resisting the higher prices the manufacturer imposed on the family 2 with the introduction of the later-generation family 5. Some customers are balking at the Hobson's choice of paying a premium for old equipment or paying thousands more on software to make the families work together. "The old programs will not run with the new CPUs and I/Os," says O'Rourke. "Any time that you have a technology change, you are vulnerable to opening the doors to competition."

Can Square D make up for lost time? Maybe, says Allen-Bradley's O'Rourke. "Any time you have the market share we have, you're vulnerable. If Square D is clever enough, they might find some niches." □

Square D is taking a bigger plunge overseas

By the turn of the century, Square D Co. president Jerre L. Stead wants one-half of sales, including those from joint ventures and alliances, to originate overseas. "We don't have the luxury of growing all our business on the continent," he says. But with international sales accounting for only 20% of sales in 1988, Square D will have to make up for lost time.

"In the United Kingdom and Australia, we are strong," says Stead. "After that, in the rest of the world we have a long way to go."

To succeed, Square D is investing heavily; 35% of sales are being plowed into international activities. "Because of aggressive investments, particularly in research and development, margins are 8% to 10% less than in the United States," he says — but improving. "We were convinced we were selling on price," he continues. "We're still paying a penalty for buying share with price. We'll be paying for another year or two."

There have been other missteps. Earnings recently improved in Mexico, a result of Square D shifting its strategy to go after the low end of the market, instead of pushing products with "bells and whistles," explains Stead. In Canada, where Square D has strong market share for several products, Square D bolstered its position by replacing top management and investing heavily in new products. "It was a good business we let get in trouble," says Stead.

Recently, the company consolidated European operations into one headquarters with new management; introduced a series of new products in Europe, where Square D is the No. 2 player in industrial automation; invested heavily in sales and marketing in the Pacific Rim from headquarters in Singapore; and is building a new factory in Thailand, where production will begin in autumn.

To serve Japan, Square D has teamed up with Idec Izumi Corp. for joint marketing, research and product development. More partnerships should follow. "We are looking actively for the right acquisition or joint venture in Europe," says Stead.

Even this strategy may fall short. "It's hard to go completely alone and make it in the global marketplace," says J. Tracy O'Rourke, president of Allen-Bradley Co., the industry leader. "We've been aggressive with that. They're just beginning. It's not just an issue of financial resources." □

Top bosses' pay slows in sluggish electronics sector

Growth in cash compensation for top 100 executives was the slowest in three years, showing basic weakness in the industry

BY BRUCE RAYNER and LINDA STALLMANN

Granted, it might be hard to take pity on these folks. As members of high tech's upper echelon, every one of the 100 highest-paid executives in the exclusive ELECTRONIC BUSINESS annual salary survey could still swear to be drawing in the upper six figures. Nonetheless, the superstars of the executive suite barely kept pace with inflation in 1988, while the rank and file of electronics executives managed to keep moving ahead.

What's more, parts of this constellation actually began to burn out. The million dollar club shrank, from 17 to 11 members. Even worse, the number of executives in the megabucks who took pay *cuts* last year more than tripled, growing from seven to 22. That is the worst result since the industry's recession year of 1985, when 31 suffered lower pay.

At the top of the list again was 49-year-old John Sculley, Apple Computer Inc.'s chairman, president and chief executive, who made nearly $2.5 million in salary and bonuses last year. His pay was a third higher than that of second-placed Joseph R. "Rod" Canion, president, chief executive and director of Compaq Computer Corp. Sculley has ranked at or near the top of the list since ELECTRONIC BUSINESS began compiling it in 1984. Sculley's pay rose 15.8%, while Canion's 35.8% raise helped move him up from fourth place in 1987.

Still, the average pay increase for the industry's top 100 executives rose by only 4.6% in 1988, significantly slower than pay increases in any year since 1985. Adjusting for inflation, last year's increase was a paltry 0.4%. This slow growth compares unfavorably with the 10% to 14% executive pay growth for industry in general.

Don't shed too many tears for these men, though. (There are no women, by the way.) These heavy hitters' salaries and bonuses averaged $821,000 in 1988, up from the average of $785,200 in 1987. Information in the listing was culled from proxy statements and interviews at publicly held, U.S.-owned companies doing at least 70% of their business in electronics. The figures do not include the value of stock or stock options.

Ellison: 48th to seventh

Besides Sculley, a top-10 executive with one of the biggest smiles may be Lawrence Ellison, the president and chief executive of Oracle Systems Corp., who rose from 48th place in 1987 to capture the seventh spot in 1988. His pay package nearly doubled from $711,875 to almost $1.4 million. Even more meteoric, however, were the rises of Thomas C. Roberts, executive vice president of Control Data Corp., and Ben Newitt, vice chairman and chief executive of Applied Magnetics Corp., in the 11th and 12th spots, respectively. Neither made the list last year. Roberts, who resigned in late December, almost tripled his pay, bringing in a cool $1 million in 1988; meanwhile, Newitt's base pay of $230,000, with bonuses totaling $999,705, garnered him a 138.6% increase over 1987.

One trend is that the average age of the very well paid is declining. In 1985, it stood around a mature 55 years old. By 1988, the average was down to about 52 years, having posted a steady drop over the past four years. This year's youngest executive is 35-year-old Gary Kennedy, vice president of Oracle Systems Corp. and ranked in 99th place. The oldest was Litton Industries Inc.'s chairman Fred O'Green, 67, ranked at number 20.

These results, coupled with lower average pay increases for the year, imply that 1988 was not such a good year for electronics honchos. Indeed, while sales grew by more than 12% for the top 200 companies, profits were off an average of 3%. At the same time, both return on equity (ROE) and return on investment (ROI) for the same 200 companies fell, and stock prices were slow to rebound after the Crash of October 1987.

A case in point is Seagate Technology Inc., a maker of disk drives. Chairman and CEO Alan Shugart and executive V.P. and chief technical officer Douglas Mahon saw their pay drop steeply in 1988, due to poor company performance, which included a $5.5 million net loss. Both were in the top 10 last year. In the latest survey, Shugart ranked 44th, Mahon 45rd.

Most companies tie bonuses and sometimes salaries to performance. Short-term financial incentives in-

Executive pay

Still sailing right along: the five best-paid execs in the electronics business in 1988 were, clockwise from upper left, Compaq's Rod Canion, Apple's John Sculley, Computer Associates' Charles Wang, Unisys' J. Michael Blumenthal, and IBM's John Akers

clude ROI, ROE and earning per share. Long-term incentives focus on market share growth, productivity improvements and product development speed. In general, the higher the executives, the more their pay is tied to general corporate performance, while compensation in the lower ranks is measured more by individual goals.

IBM's proxy statement gives some insight into what motivates its top executives. "Compensation is directly related to performance and the need to remain competitive with other companies," the report reads. "Approximately two-thirds of this compensation is dependent on business results or the market value of IBM stock." Salaries are determined by "individual contribution and performance," it goes on to say, and annual incentive awards are based on IBM or internal business-unit results.

Luckily for John Akers, IBM's chairman, the company turned in a respectable performance in fiscal 1988. That helped propel him to the fifth slot on the ELECTRONIC BUSINESS list, with an annual salary of more than $1.5 million, nearly double what he made in 1987. It is the first time Akers has been in the ELECTRONIC BUSINESS top 10.

Salaries and annual bonuses are only part of the compensation picture. Indeed, long-term compensation, usually in the form of stock options, has always been a major factor in executive compensation, especially in high technology. Ted Buyniski, a senior compensation consultant at Sibson & Co., believes that an increasing reliance on stock options may in part explain the apparently lackluster performance in electronics compensation.

Chris Blake, senior vice president in San Jose for Lee Hecht Harrison Inc., an executive out-placement firm, however, disagrees. "Equity has always been important to executives in Silicon Valley," she says. ▷

Still, an upward trend in giving stock is present. Over the past 10 years, long-term incentive plans such as stock options have grown from 15% to 42% of total direct compensation, according to Buyniski. On the other hand, base salary has dropped in importance from 60% to 40%, while short-term incentives — namely, bonuses — fell from 25% to 18%.

Long-term incentives grow

One reason is stockholders are demanding that managers be more vested in a company's success. The same goes for outside directors, Buyniski says. How the mix will play itself out in the next few years is unclear, but between one-half and two-thirds of a typical executive compensation package might soon come from long-term stock options, he estimates.

Take Sculley, for instance. He exercised options on the company's 1981 plan over the past three years to the tune of $7 million. He also has options on 767,000 Apple shares at $26.38 under the company's long-term stock option plan. As of December 5, 1988, Sculley beneficially owned 805,762 Apple shares. According to Buyniski, executives like Sculley are more likely to opt for long-term stock plans rather than cash payments, because the potential rewards can be staggering.

In the past, incentive stock options were among the most popular vehicles to motivate executives. But today, with changes in tax laws the trend is toward other stock options, such as nonqualified stock options, stock appreciation rights and performance-based stock plans.

ISOs have waned in popularity because of the removal of the differential between the capital-gains and the income tax rates. Another factor was that the Financial Accounting Standards Board threatened to change the tax treatment of ISOs. Right now, the board has put the issue on hold, and observers don't expect any resurrection of the issue for at least three years.

The one remaining advantage of ISOs is that taxes can be deferred. But even that is a hollow argument. Given the perception that tax rates are lower now than they will be in the foreseeable future, deferment is inconsequential. The same goes for other cash deferment plans.

Measuring performance

The 10 most common performance measures used as executive incentives

Net income	32%
Pretax earnings	30%
Discretionary	19%
Return on equity	18%
Earnings per share growth	16%
Return on assets	14%
Target sales	14%
Return on investment	8%
Target cash flow	5%
Return on sales	3%

Total exceeds 100% due to multiple responses

Source: Sibson & Co.

New and innovative stock option plans are always being devised to replace ISOs. The idea is to increase motivation for the long term, according to Sibson's Buyniski. One such plan relies on future stock prices. Say a company's stock is trading at $20 and is expected to rise to $30 in three years. As a way to entice a high-powered executive, the traditional approach would be to offer options on 1,000 shares at $20 a share.

The new thinking, Buyniski says, is to offer the executive options on maybe 5,000 shares at $30. In this way, the payoff is greater if the executive can grow the company beyond $30 a share. At the same time, the shareholders are more assured the executive will stick around for a while. While a few companies are thinking about this type of approach, none have yet put it into action, he says.

Stockholders are demanding that managers and outside directors be more vested in a company's success

Along the same lines, more companies are employing performance-based stock plans, often with restricted stock. These are shares granted and then later earned by an executive during a given period, usually three to five years, based on the attainment of certain company goals. The value of the award is based on value of the stock at the end of the period or its projected value.

Another critical issue for executives in this age of mergers and acquisitions is the need for a change-of-control contract, also known a golden parachute. "We don't care how big the company is, it makes good business sense," says compensation expert Larry Wangler of Towers, Perrin, Forster & Crosby.

For example, Paul Stern, former president of Unisys Corp., actually earned more than top-ranked John Sculley last year. Stern resigned from Unisys on December 31, 1987, but still raked in more than $2.5 million in 1988. His separation payment came to more than $2 million, plus he made $30,000 a month for the first six months of the year as a company consultant. All told, he took home nearly $49,000 a week in 1988.

There is more. "Among other things," reads the 1988 Unisys proxy statement, "Dr. Stern is entitled to a pension plan (inclusive of social security) in annual amounts ranging from $98,146 at age 55 to $245,364 at age 65 and continued medical plan coverage." All his stock options were also accelerated, including stock appreciation rights. Stern was hired by Northern Telecom Canada Ltd. in March 1989.

Chances are, big separation payments like Stern's will be around in the future, but industry sources say designing them will become more costly and time consuming. The Internal Revenue Service recently formalized its 5-year-old 280G regulations outlining the tax consequences for golden parachutes, making the rules somewhat more rigid.

In essence, an executive is allowed up to 2.99 times his average W-2 pay for the past five years. Any separation payment more than that amount will get hit with an excise tax of 20%. To avoid the added cost, experts are suggesting such alternatives as employment contracts and severance arrangements not contingent on changes in corporate control.

Will 1989 and beyond be better years for executives than 1988? That depends on how well the economy shapes up and how well high-tech stocks perform. Sibson & Co. is forecasting growth this year in total compensation for all industry at around 10%, the same as 1988, and base salary growth of 6.9%, compared with the 6.7% growth in 1988. □

Top paid U.S. executives

Rank	Executive/age	1988 salary	Percentage change from 1987	Company	Position
1	**John Sculley**/49	$2,479,000	15.8%	Apple Computer	Chairman, President, CEO
2	**Joseph R. Canion**/44	1,866,839	35.8%	Compaq Computer	President, CEO, Director
3	**Charles B. Wang**/44	1,794,000	25.4%	Computer Associates	CEO, Chairman
4	**W. Michael Blumenthal**/63	1,662,886	7.3%	Unisys	Chairman, CEO
5	**John F. Akers**/54	1,525,500	81.4%	IBM	Chairman
6	**Anthony W. Wang**/46	1,521,000	28.0%	Computer Associates	President, COO, Director
7	**Lawrence J. Ellison**/44	1,362,500	91.4%	Oracle Systems	President, CEO
8	**John A. Young**/56	1,342,232	12.5%	Hewlett-Packard	President, CEO, Chairman
9	**Melvin Howard**/54	1,269,153	44.9%	Xerox	Vice Chairman
10	**Charles E. Exley Jr.**/59	1,069,390	6.8%	NCR	Chairman
11	**Thomas C. Roberts**/47[1]	1,016,240	149.6%	Control Data	Executive VP
12	**Ben J. Newitt**/63	999,705	138.6%	Applied Magnetics	Vice Chairman, CEO
13	**Orion L. Hoch**/59	997,227	27.4%	Litton Industries	Chairman, CEO
14	**David T. Mitchell**/46	991,941	-26.8%	Seagate Technology	President, COO
15	**John T. Hartley**/58	983,400	20.0%	Harris	Chairman, President
16	**K.V. Cassani**/60	979,750	46.8%	IBM	Vice Chairman
17	**Jack D. Kuehler**/56	969,900	47.8%	IBM	Vice Chairman
18	**Michael H. Spindler**/46	958,000	35.1%	Apple Computer	Senior VP, President, Apple Europe
19	**David R. Tacke**/66	943,898	12.7%	E-Systems	Chairman, CEO
20	**Fred W. O'Green**/67	937,478	-8.3%	Litton Industries	Chairman
21	**Kenneth H. Olsen**/62	931,527	2.9%	Digital Equipment	President, CEO, Director
22	**John C. Lewis**/53	929,588	3.5%	Amdahl	Chairman, CEO
23	**David T. Kearns**/58	928,184	-20.4%	Xerox	Chairman, CEO
24	**Frank G. Hickey**/60	927,750	16.3%	General Instrument	Chairman, CEO
25	**Delbert W. Yocam**/44	923,000	10.9%	Apple Computer	Senior VP, President, Apple Pacific
26	**E. Joseph Zemke**/48	917,129	51.6%	Amdahl	President, COO, Director
27	**Leon Machiz**/64	904,436	11.0%	Avnet	Vice Chairman, COO, President
28	**Bertil D. Nordin**/54	895,874	30.6%	Digital Communications	Chairman, CEO
29	**Joe M. Henson**/55[2]	894,368	21.2%	Prime Computer	President, CEO, Director
30	**Eckhard Pfeiffer**/46	893,188	7.9%	Compaq Computer	Senior VP International Operations
31	**Marshall D. Butler**/62	883,960	30.2%	AVX	Chairman
32	**John V. Roach**/49	871,556	-4.9%	Tandy	Chairman, CEO, President
33	**Ray Stata**/54	869,868	NA	Analog Devices	Chairman, President
34	**Robert M. Price**/58	862,400	-2.6%	Control Data	Chairman, CEO
35	**George B. Harvey**/57	858,538	8.1%	Pitney Bowes	Chairman, President, CEO
36	**Dean O. Morton**/56	840,678	12.1%	Hewlett-Packard	Executive VP, COO, Director
37	**William J. Weisz**/61	824,256	10.5%	Motorola	Vice Chairman
38	**William W. Lane**/54	812,352	-1.8%	Emerson Radio	Chairman
39	**Stephen L. Lane**/52	812,352	-1.8%	Emerson Radio	President
40	**Jean-Louis Gassee**/44	800,000	-3.7%	Apple Computer	Senior VP, President, Apple Products
41	**Jerry R. Junkins**/51	798,250	16.5%	Texas Instruments	Chairman, President, CEO
42	**William R. Anderson**/49	796,521	NA	Applied Magnetics	President
43	**Douglas K. Mahon**/47	788,061	-38.1%	Seagate Technology	Executive VP, Chief Technical Officer
44	**Alan F. Shugart**/57	762,048	-39.7%	Seagate Technology	Chairman, CEO
45	**James A. Unruh**/47	756,771	-4.9%	Unisys	Executive VP
46	**John F. Mitchell**/60	751,659	10.6%	Motorola	Vice Chairman
47	**Horace G. McDonnell Jr.**/60	749,948	90.0%	Perkin Elmer	Chairman, CEO
48	**W.J. Sanders III**/52	738,863	-30.1%	Advanced Micro Devices	Chairman, CEO
49	**Andrew S. Grove**/52	736,487	5.7%	Intel	President, CEO, Director
50	**James L. Donald**/57	732,224	7.9%	DSC Communications	President, CEO

[1] resigned December 12, 1988

[2] resigned December 30, 1988. Mr. Henson also received the additional sum of $1,152,500 upon his resignation

(Continued)

Top paid U.S. executives

Rank	Executive/age	1988 salary	Percentage change from 1987	Company	Position
51	**Edward M. Esber, Jr.**/36	$731,934	-16.3%	Ashton-Tate	Chairman, CEO
52	**Ward D. Parkinson**/43	718,918	NA	Micron Technology	Vice Chairman
53	**Albert A. Eisenstat**/58	718,000	12.2%	Apple Computer	Senior VP, Secretary
54	**John F. Gribl**/47	715,868	10.1%	Compaq Computer	Senior VP Corporate Administration
55	**Robert W. Galvin**/66	700,000	16.7%	Motorola	Chairman
56	**Edward Botwinick**/54	698,602	NA	Unisys	Senior VP
57	**Gordon E. Moore**/60	697,987	2.0%	Intel	Chairman
58	**Michael S. Swavely**/35	695,622	15.9%	Compaq Computer	VP, Sales & Marketing
59	**Joseph L. Parkinson**/43	691,294	NA	Micron Technology	Chairman, CEO
60	**F.A. Metz, Jr.**/55	689,513	52.6%	IBM	Senior VP
61	**Thomas A. Vanderslice**/57	680,183	4.6%	Apollo	Chairman, CEO
62	**Ryal R. Poppa**/55	678,766	-21.0%	Storage Technology	Chairman, CEO, President
63	**William E. Johnson**/46	671,515	30.5%	Scientific-Atlanta	Vice Chairman, CEO, Director
64	**George E. Safiol**/56	665,000	37.0%	General Instrument	President, COO
65	**George M.C. Fisher**/48	659,877	35.2%	Motorola	CEO, President & Director
66	**Joseph T. Casey**/57	655,332	22.5%	Litton Industries	Vice Chairman, CFO
67	**Sidney Topol**/63	654,837	-4.5%	Scientific-Atlanta	Chairman
68	**James M. Harris**/45	645,900	NA	Compaq Computer	VP Engineering
69	**Jack C. Davis**/50	645,890	33.6%	Dataproducts	Chairman, President, CEO
70	**William F. Glavin**/57	645,675	-19.3%	Xerox	Vice Chairman
71	**Eugene R. White**/57	640,994	-6.1%	Amdal	Vice Chairman
72	**Dennis C. Fill**/59	629,141	57.1%	Westmark International	Chairman, CEO, President
73	**Paul A. Allaire**/50	627,312	-11.5%	Xerox	President
74	**G.P. Sprague, Jr.**/52	626,322	NA	Applied Magnetics	Executive VP
75	**Jerry K. Pearlman**/49	621,750	42.9%	Zenith Electronics	Chairman, President, CEO
76	**Bernard S. Appel**/57	620,948	-5.9%	Tandy	President Radio Shack Div
77	**Robert J. Potter**/55	618,000	NA	Datapoint	President, CEO
78	**E. Gene Keiffer**/59	615,099	21.2%	E-Systems	President
79	**Walter F. Raab**/64	611,990	13.1%	AMP	Chairman, CEO, Director
80	**Gary L. Tooker**/49	605,919	25.4%	Motorola	COO, Sr. Exec. VP, Director
81	**Ronald W. Braniff**/52	588,813	NA	Ask Computer Systems	President, CEO
82	**Curtis A. Hessler**/45	588,125	NA	Unisys	Executive VP
83	**David A. Bossen**/62	581,009	7.0%	Measurex	President, CEO, Director
84	**William E. Terry**/55	579,494	8.7%	Hewlett-Packard	Executive VP, Director
85	**James C. Morgan**/50	579,207	NA	Applied Materials	Chairman, CEO
86	**M. Howard Dingman, Jr.**/62	578,527	15.9%	Litton Industries	Senior VP
87	**Hollis L. Caswell**/58	575,981	9.3%	Unisys	Senior VP
88	**Edson D. de Castro**/50	575,942	36.7%	Data General	President
89	**James J. Renier**/59	574,516	-33.3%	Honeywell	Chairman, CEO, Director
90	**Charles E. Sporck**/60	571,615	48.9%	National Semiconductor	President, CEO
91	**Edward F. Kosnick**/44	570,000	34.1%	Sprague Technologies	President, CEO
92	**Roger W. Johnson**/54	565,578	4.3%	Western Digital	Chairman, President, CEO
93	**Thomas D. Sege**/62	562,485	27.0%	Varian Associates	Chairman, CEO
94	**O. M. Fundingsland**/46	560,633	NA	Applied Magnetics	Executive VP Sales and Marketing
95	**Edson W. Spencer**/62	557,620	-45.0%	Honeywell	Chairman, Director
96	**W. Frank King III**/49	556,271	NA	Lotus Developement	Senior VP
97	**Jim P. Manzi**/37	550,004	-41.5%	Lotus Developement	President, Chairman, Director
98	**Gaynor N. Kelley**/57	548,063	NA	Perkin Elmer	President, COO
99	**Gary Kennedy**/35	546,760	31.1%	Oracle Systems	Senior VP
100	**Leslie L. Vadasz**/52	545,500	4.9%	Intel	Senior VP, Director

Source: ELECTRONIC BUSINESS

European auto market beckons chip producers

New emissions rules for European Community nations plus automakers' awareness of their own lag in using electronic components add up to big opportunities

BY ANDY ROSENBAUM

The global automobile market has become increasingly important to semiconductor producers. But if chip makers have been depressed by a U.S. car market that is stuck in neutral, they should look eastward to Europe, where car sales are zooming along in overdrive.

The boom in European car sales continues, running above what is expected for this year. According to DRI Europe, a research and consulting concern in London, 11.75 million units were sold in European Community (EC) countries in 1988; this figure is predicted to rise to more than 12 million units this year.

The European car market should continue to demand significantly more chips than the U.S. market in the next few years, observers say. An EC decision on auto emissions doesn't hurt, either. The ruling will step up demand for electronic mixture controls, representing a bonanza for integrated-circuit (IC) producers. So far, European car makers have lagged way behind those in the United States and Japan in exploiting electronics technology.

"The average spent on electronics per car in the EC is currently only about $50," says Dennis Exton, an analyst with UBS-Phillips & Drew in London. "By 1992, we expect it to reach $250." According to market research firm Dataquest Inc. in San Jose, the average per American vehicle was $95 last year, forecast to rise to $133 in 1992.

The EC decision on auto emissions will provoke the first spurt of growth. In June, after weeks of stormy disputes, the EC reached a definitive agreement on automobile emissions. The tough new standards to be introduced in 1990 make use of electronic mixture controls obligatory on a wide range of cars. Manufacturers all over Europe are adapting to the change. The electronics division of Ford Motor Co. in Michigan is building a new plant in Spain to provide the necessary components; in Torino, Italy, Fiat SpA has already offered several new car lines with the controls as part of the standard model.

Change in attitude

Just as important as the change in EC regulations will be the change in attitude toward electronics on the part of European car manufacturers.

"The Europeans were skeptical about using electronics to provide better product differentiation," says Karl Ludvigsen, managing director of the automotive consulting firm Ludvigsen Associates Ltd. in London. A problem car manufacturers face everywhere is convincing the consumer that a particular product is special, he adds.

BMW was one of the first European automobile manufacturers to recognize the advantages of electronics for marketing. At a convention in Scotland last year, BMW's electronics manager Peter K. Thoma called for closer cooperation between semiconductor producers and European car manufacturers.

"In fact, this close cooperation is essential," insists Enrico Ferrati, research and development manager at Magneti Marelli SpA in Italy. The Fiat-owned auto component producer — one of Europe's largest — spent $40 million on semiconductors in 1988 and expects that to increase by 20% this year.

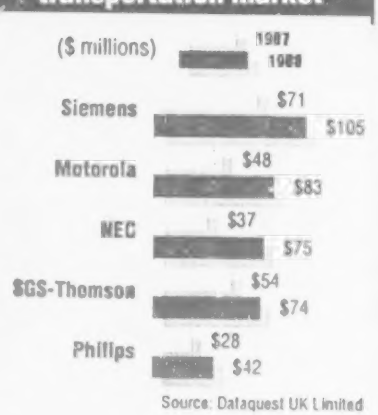
"The trend is for an automobile manufacturer to buy an entire system from a components producer, not just isolated parts," Ferrati says, pointing out that his company maintains a center for product development and works directly with IC producers to design components.

Competition in the automobile market will be ferocious, analysts contend. Many of the major European IC producers have already targeted automobiles as a growth area.

Intel Europe is already selling several million units a year to the transportation sector, automotive marketing manager Jamie Kirk says. "Networking controllers are going to become a big part of the market in Europe," he adds. "The object will be to create a single system that reads the road, observes vehicle speed, etc. All the different modules will communicate with each other, enabling greater flexibility. This is definitely a growth area."

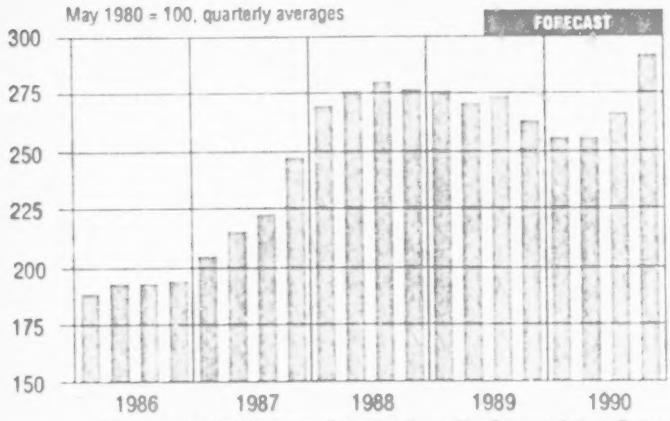
Hitachi Europe, based in London, is also working closely with automobile producers to exploit the fast-growing market. In May, it introduced two new integrated circuits intended specifically for automotive components. □

Top semiconductor suppliers to the European transportation market



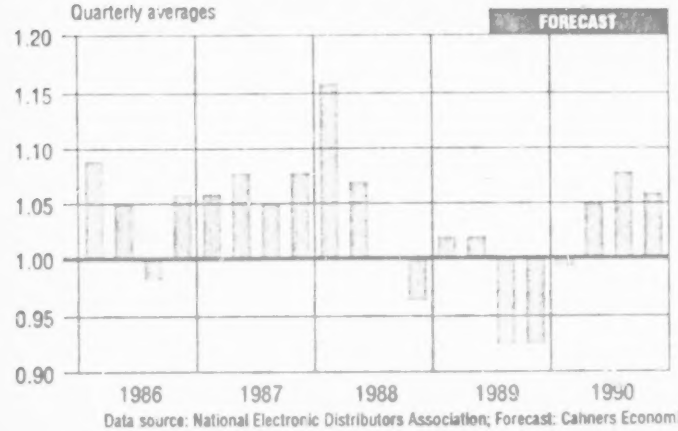
Source: Dataquest UK Limited

Distributors' shipment index



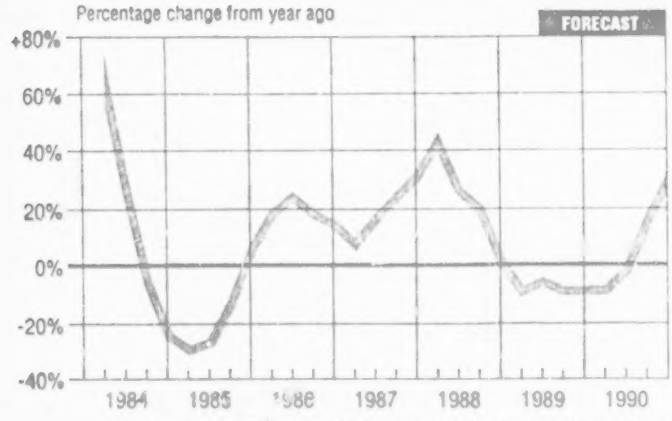
Data source: National Electronic Distributors Association; Forecast: Cahners Economics

Distributors' book-to-bill ratio



Data source: National Electronic Distributors Association; Forecast: Cahners Economics

Distributors' new orders



Data source: National Electronic Distributors Association; Forecast: Cahners Economics

Distributor orders drop again — what's next?

Rumbles of a slowdown have been building for months now in the electronics industry. For distributors, the rumblings have suddenly blasted loud and clear through the bullhorn we call bookings. Bookings, or new orders, provide some hint of what's to come for shipments ahead — and the news is just as expected. Bookings had dropped 10% in the first quarter of 1989 from the first quarter of 1988. Now, the National Electronic Distributors Association (NEDA) reports second quarter bookings also fell 6% from the year-ago quarter.

That's the first time bookings have slipped relative to year-ago levels for two consecutive quarters since the end of 1984. But as I've been writing over the past year, this current economic slowdown will be far different than the 1984-1985 distributor debacle. For example, bookings dropped 6% in the third quarter of 1984 from year-ago levels and then tumbled 25% in the final quarter of 1984. The last recession hit hard and fast.

Forecast for distributor orders

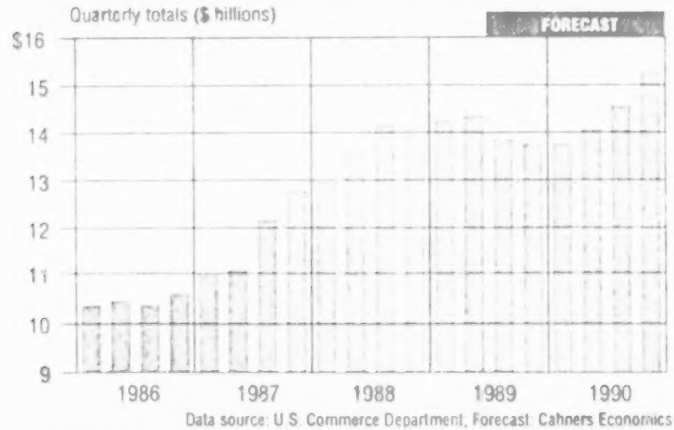
I continue to believe that the current distributor downturn will be softer and slower than in 1985. Cahners Economics' forecast for distributor orders projects another 10% decline in the latest summer quarter and a 9% drop in the final quarter of this year. But after two more quarterly declines in early 1990, distributor bookings are expected to begin rising again by next summer.

What anchors this optimism? First, distributors are in better shape this time around. Average revenue per employee jumped 17% from 1987 to 1988 as time-saving, employee-saving new technologies have been implemented. Inventories are being watched more closely now than ever before. And distributors, burned badly in 1985, are refusing to be burned again by responding early to signals of a slowdown now.

Of course, this is an economic projection — and lots of assumptions on which a forecast is built can change. Every forecaster says that; it's sort of our version of caveat emptor. Will my forecast for distributor orders be correct? Only time will tell. So check back in this column next quarter.

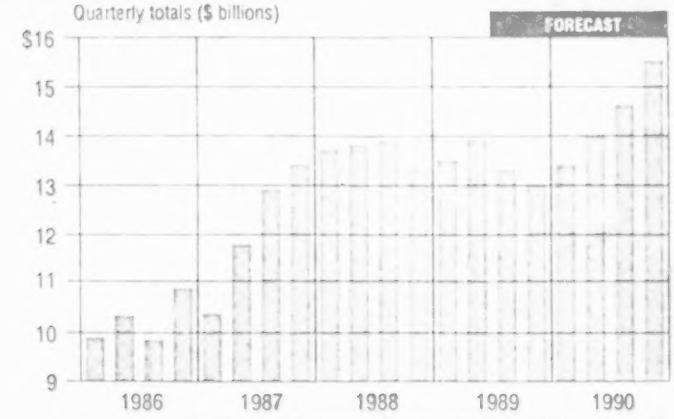
ELIZABETH B. BAATZ

Electronic component shipments



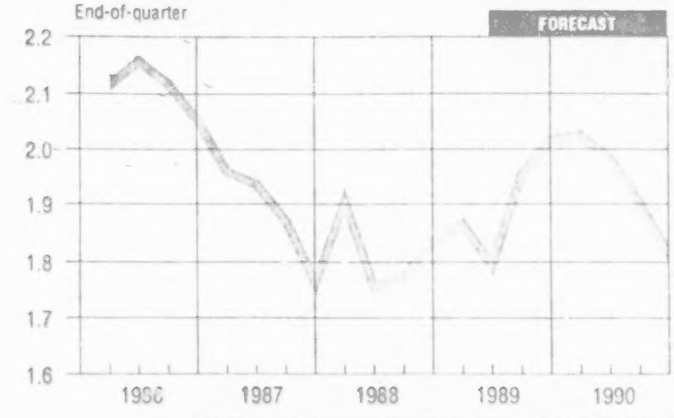
Data source: U.S. Commerce Department; Forecast: Cahners Economics

Electronic component new orders



Data source: U.S. Commerce Department; Forecast: Cahners Economics

Electronic component inventory-to-shipments ratio



Data source: U.S. Commerce Department; Forecast: Cahners Economics

Component shipments still growing . . . slowly

Like the computer, instrument, distributor and other electronic markets, components manufacturers have also succumbed to an economic slowdown. U.S. manufacturers shipped $14.5 billion worth of resistors, capacitors, printed circuit boards, semiconductors and other types of electronic components in the past spring quarter, according to the U.S. Commerce Department's survey of component factory shipments. Not bad. That $14.5 billion stood 1.4% higher than the previous quarter's shipments and 6.4% higher than a year earlier.

Still, for the 12 months ending June 1989, component shipments grew at a 10.2% pace, down from a peak 19.6% pace set during June 1988. The slowdown has been even more noticeable on the bookings front. Bookings, or orders, surged ahead at a 26% rate in the 12 months ending May 1988. For the 12 months ending June 1989, bookings rose at a mere 1.4% rate.

Worse yet, the slowing pattern of bookings and shipments has been going on for more than a year now. So whether we like it or not, the economic business cycle has exerted its inexorable downward pull on the components industry. The Commerce Department data do not represent an unusual blip in long-run growth. The data suggests a trend has indeed been in the making.

Slowing orders for U.S. components reflects weakness in the computer industry. The computer industry's book-to-bill ratio has fallen below one in 18 of the past 29 months. Bookings for computers and office equipment have also been slowing for the past year. Exports, which had been boosting computer sales, have slumped. Business investment in computers, while still necessary, will hit a temporary barrier in 1989 and early 1990 as lower profits translates into fewer equipment purchases.

The only question remaining for component makers: How long and how deep will this current downturn last? The answer for any one company will vary depending on product mix, share of international sales, and other such factors. Cahners Economics predicts component shipments for all U.S. factories will grow 3% this year and 2% next year, with a minor two-quarter decline in the latter half of 1989. Even if computer makers fare worse than the small slowdown we now assume, component makers could still skirt a deeper recession — thanks to the still low level of inventories that component makers are carrying now.

ELIZABETH B. BAATZ